Public Health Surveillance

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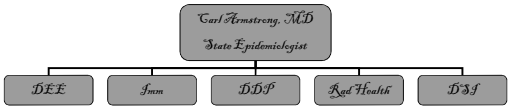
VDH VIRGINIA DEPARTMENT OF HEALTH
Protecting You and Your Environment

CDC
CENTERS FOR DISEASE CONTROL AND PREVENTION

VDH Office of Epidemiology



Objectives of Lecture

- Key concepts of surveillance
  - Definition
  - Uses
  - Methods
- Public health surveillance systems
- Use and evaluation of surveillance systems

What comes to mind when you hear 'surveillance'?

- Law enforcement agencies
- CIA

- Routine data collection
- Statistics
- Trends

Definition of PH Surveillance

- The ongoing systematic collection, analysis, and interpretation of outcome-specific data for use in the planning, implementation, and evaluation of public health practice.
- Includes data collection, analysis, and dissemination to those responsible for prevention and control.

What Surveillance Is

- Systematic, ongoing…
  - Collection
  - Analysis
  - Interpretation
  - Dissemination
- …of health outcome data

- investigation
- control
- prevention

Surveillance History in U.S.

- 1741 – Rhode Island passed an act requiring tavern keepers to report contagious disease
- 1850 – Mortality statistics first published by the federal government for the U.S.
- 1874 – Massachusetts instituted weekly reporting of diseases by physicians
- 1878 – Public Health Service (PHS)-type organization created to collect morbidity data for use in quarantine for cholera, smallpox, plague, yellow fever.

Surveillance History in U.S.

- 1901 – All states required disease reporting.
- 1925 – All states began participating in national morbidity reporting
- 1935 – First national health survey
- 1951 – Council of State and Territorial Epidemiologists (CSTE) authorized to determine diseases to be reported to PHS
- 1961 – Morbidity and Mortality Weekly Report (MMWR) published

Legal Authority for Surveillance

- Legal authority for mandatory public health surveillance resides with states
- Virginia Code
  - 32.1-35 – BOH shall promulgate a list of diseases required to be reported.
  - 32.1-36 – Physicians and laboratories shall report.
  - 32.1-37 – Medical care facilities, schools and summer camps shall report.
  - 32.1-39 – BOH shall provide for surveillance & investigation.

Purpose of Surveillance

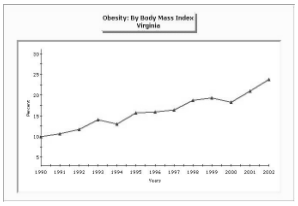
- To assess public health status, to define public health priorities, to evaluate programs, and to stimulate research.
  - Tells us where the problems are, who is affected, and where the programmatic and prevention activities should be directed.

How can surveillance data be used?

- Estimates of a health problem
- Natural history of disease
- Detection of epidemics
- Distribution and spread of a health event
- Hypothesis testing
- Evaluating control and prevention measures
- Monitoring change
- Detecting changes in health practice
- Facilitate planning

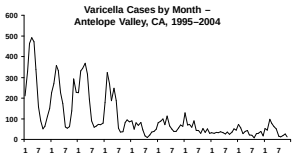
Uses of Surveillance Data Estimates of a Health Problem

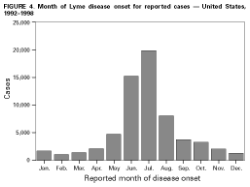
- Quantitative estimates of the magnitude of a health problem
  - including sudden or long-term changes in trends, patterns



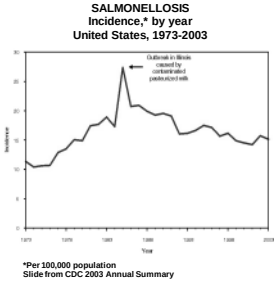
Uses of Surveillance Data
Natural History of Disease

- Portrayal of the natural history of disease (clinical spectrum, epidemiology)

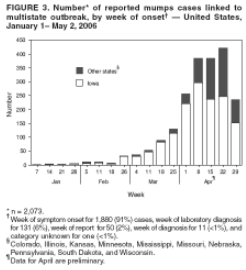




Uses of Surveillance Data
Detection of Epidemics



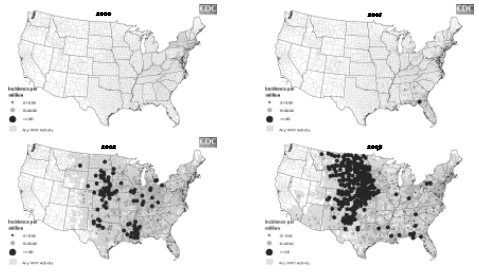
*Per 100,000 population
Slide from CDC 2003 Annual Summary



* n = 2,073.
† Week of symptom onset for 1,880 (91%) cases, week of laboratory diagnosis for 131 (6%), week of report for 50 (2%), week of diagnosis for 11 (<1%), and category unknown for one (<1%).
§ Colorado, Illinois, Kansas, Minnesota, Mississippi, Missouri, Nebraska, Pennsylvania, South Dakota, and Wisconsin.
¶ Data for April are preliminary.

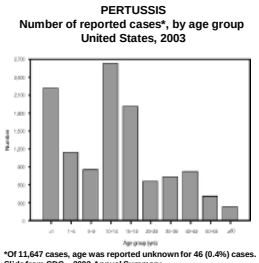
Uses of Surveillance Data
Distribution & Spread of a Health Event

- West Nile Virus in the US, 2000-2003



Use of Surveillance Data
Hypothesis Testing

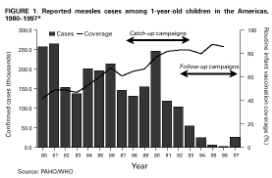
- Facilitation of epidemiologic and laboratory research
  - Hypothesis testing

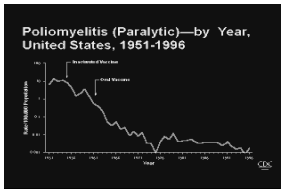


*Of 11,647 cases, age was reported unknown for 46 (0.4%) cases.
Slide from CDC – 2003 Annual Summary

Uses of Surveillance Data
Evaluating control & prevention measures

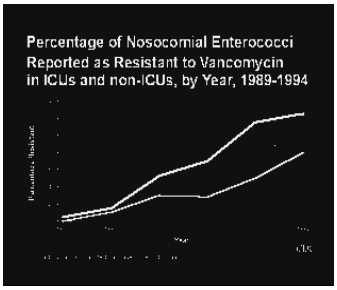
Effectiveness of vaccine introduction





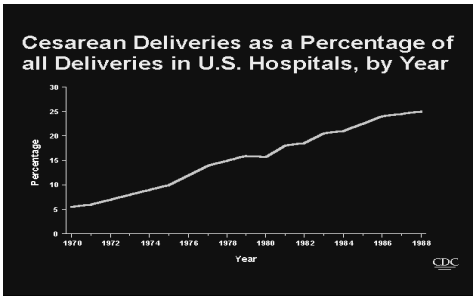
Uses of Surveillance Data
Monitoring changes

- Monitoring changes in infectious agents and host factors



National Nosocomial Infections Surveillance System

Uses of Surveillance Data Detecting Changes in Health Practice



Uses of Surveillance Data Facilitate Planning

- Identify target populations in need of health services
  - Refugee populations
  - Morbidity surveillance in emergency shelters
- Identify health topics to be addressed by educational programs and media

Outcomes

- Surveillance is outcome oriented
- Can measure frequency of an illness or injury, severity of the condition, and impact of the condition.
- Number of cases, incidence, prevalence; case fatality, hospitalization rate, mortality, disability; cost.
- Orient data by person, place, and time.

Planning a Surveillance System

- Establish objectives
- Develop case definitions
- Determine data source or data collection mechanism
- Field test methods
- Develop and test analytic approach
- Develop dissemination mechanism
- Assure use of analysis and interpretation

What Should be Under Surveillance?

- Establish priorities based on:
  - Frequency (incid., prev., mortality, YPLL)
  - Severity (case-fatality, hospitalization rate, disability rate)
  - Cost (direct and indirect)
  - Preventability
  - Communicability
  - Public interest
  - Will the data be useful for public health action?

Surveillance Methods Case Definition

- Case definition
  - Important to clearly define condition
  - Ensures same criteria are used by all
  - Makes the data more comparable
  - Include person, place, time
  - May define suspected and confirmed cases
  - May include symptoms, lab values, time period, population as appropriate

Case Definition Examples

- Weak Definition - Measles
  - Any person with a rash and fever, runny nose, or conjunctivitis
- Better Definition - Measles
  - Any person with a fever >101 F, runny nose, conjunctivitis, red blotchy rash for at least 3 days, and laboratory confirmation of IgM antibodies
- Clinical, Probable, Confirmed Case Definitions
- Outbreak Case Definition
  - Differs from routine surveillance
  - Epidemiologically linked

Surveillance Methods Data Collection

- Data collection
  - Standardized instruments, field tested
- Passive Surveillance
  - Providers are responsible for reporting.
  - Health dept. waits to receive reports.
  - Problem with underreporting
- Active Surveillance
  - Providers contacted on regular basis to collect information
  - More resource intensive
  - Used for outbreaks or pilots (e.g., HUS)

Surveillance Methods Data Analysis

- Ongoing review
- Descriptive statistics, Multivariate analyses
- Automated analyses

Disease	Number of cases

Surveillance Methods Interpretation and Dissemination

- Presentation of data in the form of tables, graphs, maps, etc.
- Disseminate data via reports, presentations, internet, etc.

Surveillance Methods Evaluation

- Did the system generate needed answers to problems?
- Was the information timely?
- Was it useful for planners, researchers, etc?
- How was the information used?
- Was it worth the effort?
- What can be done to make it better?
- (More on evaluation later).

Cycle of Surveillance

- Data Collection
  - Pertinent, regular, frequent, timely
- Consolidation and Interpretation
  - Orderly, descriptive, evaluative, timely
- Dissemination
  - Prompt, to all who need to know (data providers and action takers)
- Action to Control and Prevent
- Evaluation

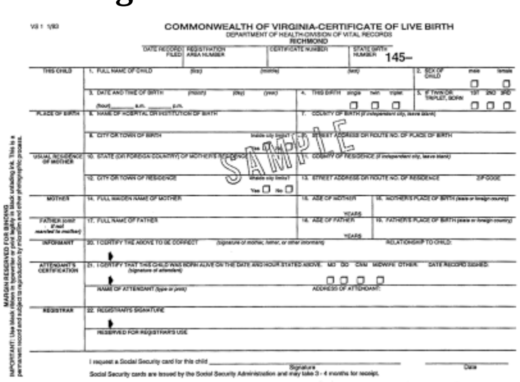
Data Sources

- Vital Statistics
- Notifiable Diseases
- Registries
- Sentinel Surveillance
- Syndromic Surveillance
- Surveys
- Administrative Data

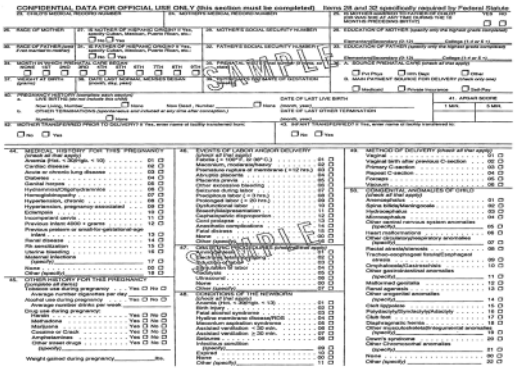
Data Sources: Vital Statistics

- Live Births
- Deaths
- Fetal Deaths
- Marriages
- Divorces
- Induced Terminations of Pregnancy
- Infant Mortality (link birth and death data)

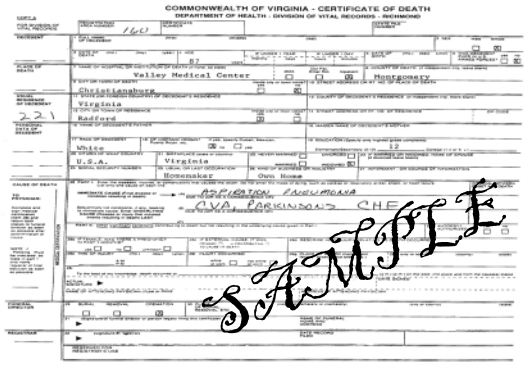
Virginia Birth Certificate


COMMONWEALTH OF VIRGINIA-CERTIFICATE OF LIVE BIRTH
DEPARTMENT OF HEALTH-DIVISION OF VITAL RECORDS
RICHMOND
STATE BIRTH NUMBER 145–
THIS CHILD
1. FULL NAME OF CHILD (first) (middle) (last)
2. SEX OF CHILD male female
3. DATE AND TIME OF BIRTH (month) (day) (year)
4. THIS BIRTH single twin triplet
5. IF TWIN OR TRIPLET, BORN 1ST 2ND 3RD
PLACE OF BIRTH
USUAL RESIDENCE OF MOTHER
MOTHER
FATHER
INFORMANT
20. I CERTIFY THE ABOVE TO BE CORRECT
RELATIONSHIP TO CHILD:
ATTENDANT'S CERTIFICATION
NAME OF ATTENDANT (type or print)
ADDRESS OF ATTENDANT:
REGISTRAR
22. REGISTRAR'S SIGNATURE
RESERVED FOR REGISTRAR'S USE
I request a Social Security card for this child
Signature
Date
Social Security cards are issued by the Social Security Administration and may take 3 - 4 months for receipt.
MARGIN RESERVED FOR BINDING
SAMPLE

Virginia Birth Certificate



Virginia Death Certificate



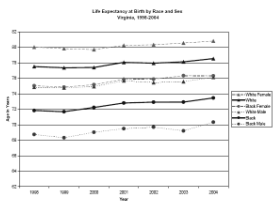
Uses of Vital Statistics Data

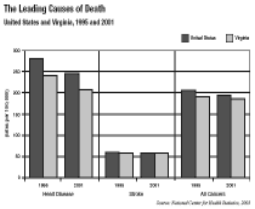
- Monitoring long-term trends
- Identifying differences in health status within racial or other population subgroups
- Assessing differences by geographic area
- Monitoring deaths that are preventable
- Generating hypotheses about causation
- Monitoring progress toward improved health of the population; health-planning

Vital Records: Coding and Calculating

- ICD-9 historically, now ICD-10
- Infant mortality - need number of live births for denominator in calculating rates
- Other death rates - use total population in rate calculations.
- Crude and adjusted (standardized) rates used.

Vital Statistics Data





Quality of Vital Stats Depends on

- Care taken by health care providers in ascertaining cause of death and other factors
- Accuracy of coding (difficult for injuries)
- Relevance of existing codes for the condition being recorded
- Accuracy of population estimates
- Problems - don't know onset, can't see effect of diseases that don't lead to death

Data Sources: Notifiable Diseases

- States decide what is notifiable/reportable
  - Based on disease occurrence, potential for outbreaks, public perception of risk, etc.
  - CSTE recommendations
  - Different processes for generating N.D. list
- Weekly (or sometimes rapid) reporting to health departments by physicians, medical care facilities, laboratories.
  - States report to CDC

Reportable Disease List

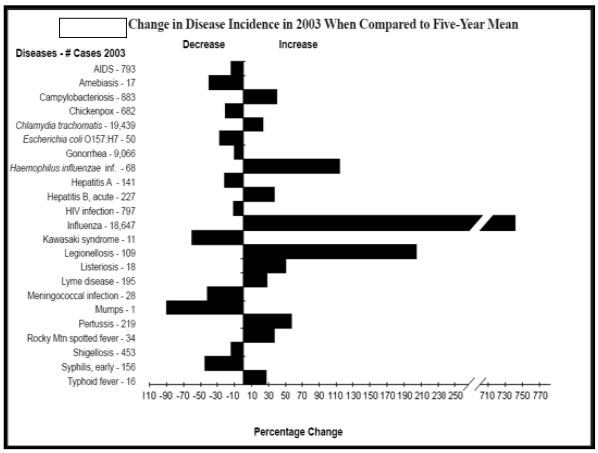
Over 70 reportable diseases/conditions

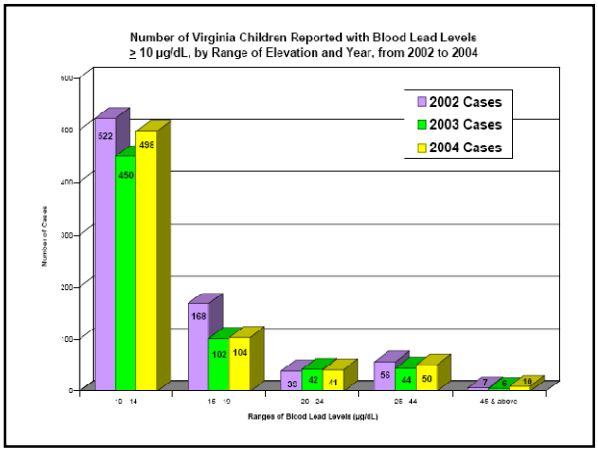
Acquired immunodeficiency syndrome (AIDS)
Amebiasis *
ANTHRAX *
Arboviral infection (e.g., EEE, LAC, SLE, WNV) *
BOTULISM *
BRUCELLOSIS *
Campylobacter infection *
Chancroid *
Chickenpox *
Chlamydia trachomatis infection *
CHOLERA *
Creutzfeldt-Jakob disease if <55 years of age *
Cryptosporidiosis *
Cyclosporiasis *
DIPHTHERIA *
DISEASE CAUSED BY AN AGENT THAT MAY HAVE BEEN USED AS A WEAPON
Ehrlichiosis *
Escherichia coli O157:H7 and other enterohemorrhagic *E. coli* infections *
Giardiasis *
Gonorrhea *
Granuloma inguinale
HAEMOPHILUS INFLUENZAE INFECTION, INVASIVE *
Hantavirus pulmonary syndrome
Hemolytic uremic syndrome (HUS)
HEPATITIS A *
Hepatitis B (acute and chronic) *
Hepatitis C (acute and chronic) *
Hepatitis, other acute viral
Human immunodeficiency virus (HIV) infection *
Influenza *¶
Kawasaki syndrome
Lead, elevated blood levels *
Legionellosis *
Leprosy (Hansen's disease)
Listeriosis *
Lyme disease
Lymphogranuloma venereum
Malaria *
MEASLES (Rubeola)
MENINGOCOCCAL INFECTION *
MONKEYPOX *
Mumps *
Ophthalmia neonatorum
OUTBREAKS, ALL (including foodborne, nosocomial, occupational, toxic substance-related, waterborne and other outbreaks)
PERTUSSIS (Whooping cough) *
PLAGUE *
POLIOMYELITIS *
PSITTACOSIS *
Q FEVER *
RABIES, HUMAN AND ANIMAL *
Rabies treatment, postexposure
Rocky Mountain spotted fever *
RUBELLA (German measles), including congenital rubella syndrome *
Salmonellosis *
SEVERE ACUTE RESPIRATORY SYNDROME (SARS) *
Shigellosis *
SMALLPOX (Variola) *
Streptococcal disease, Group A, invasive *
Streptococcus pneumoniae, invasive if <5 years of age *
Syphilis (report PRIMARY and SECONDARY syphilis by rapid means) *
Tetanus
Toxic shock syndrome
Toxic substance-related illness
Trichinosis (Trichinellosis) *
TUBERCULOSIS, ACTIVE DISEASE (MYCOBACTERIA *~)
Tuberculosis infection in children age <4 years
TULAREMIA *
Typhoid fever
Typhus *
UNUSUAL OCCURRENCE OF DISEASE OF PUBLIC HEALTH CONCERN
VACCINIA, DISEASE OR ADVERSE EVENT *
Vancomycin-resistant *Staphylococcus aureus* *
VIBRIO INFECTION *
VIRAL HEMORRHAGIC FEVER *
YELLOW FEVER *

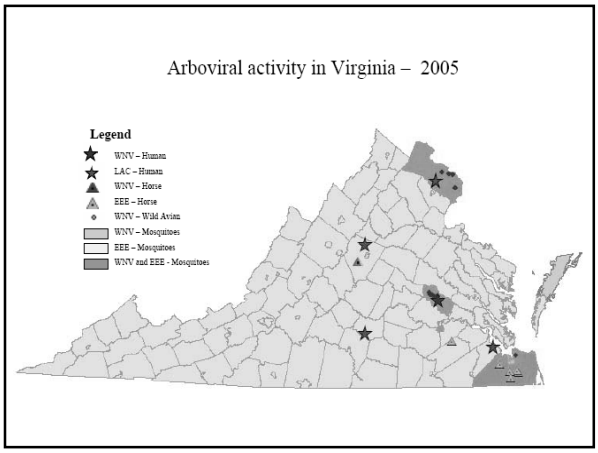
UPPER CASE indicates conditions that must be reported rapidly to the local health director via telecommunication.

Epi-1 Form

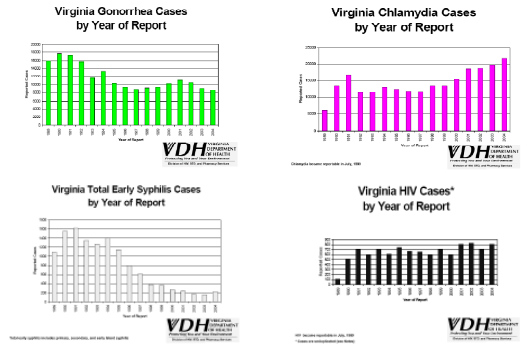

VIRGINIA DEPARTMENT OF HEALTH
Confidential Morbidity Report
Laboratory Information and Results
Other Information
Please complete as much of this form as possible.


Change in Disease Incidence in 2003 When Compared to Five-Year Mean
Decrease
Increase
Diseases - # Cases 2003
AIDS - 793
Amebiasis - 17
Campylobacteriosis - 883
Chickenpox - 682
Chlamydia trachomatis - 19,439
Escherichia coli O157:H7 - 50
Gonorrhea - 9,066
Haemophilus influenzae inf. - 68
Hepatitis A - 141
Hepatitis B, acute - 227
HIV infection - 797
Influenza - 18,647
Kawasaki syndrome - 11
Legionellosis - 109
Listeriosis - 18
Lyme disease - 195
Meningococcal infection - 28
Mumps - 1
Pertussis - 219
Rocky Mtn spotted fever - 34
Shigellosis - 453
Syphilis, early - 156
Typhoid fever - 16
-110 -90 -70 -50 -30 -10 10 30 50 70 90 110 130 150 170 190 210 230 250 710 730 750 770
Percentage Change


Number of Virginia Children Reported with Blood Lead Levels
≥ 10 µg/dL, by Range of Elevation and Year, from 2002 to 2004
2002 Cases
2003 Cases
2004 Cases
Number of Cases
522
450
498
168
102
104
30
42
41
55
44
50
7
5
16
Ranges of Blood Lead Levels (µg/dL)


Arboviral activity in Virginia – 2005
Legend
WNV – Human
LAC – Human
WNV – Horse
EEE – Horse
WNV – Wild Avian
WNV – Mosquitoes
EEE – Mosquitoes
WNV and EEE - Mosquitoes

STD and HIV Trends



Limitations of Disease Reporting

- Underreporting
  - Reporting better for more serious diseases and those for which there is laboratory confirmation
  - Need to seek medical consultation to be diagnosed and then reported
- Lack of representativeness of reported cases
- Inconsistent case definitions

Reasons for Not Reporting

- Assume someone else reported.
- Did not know reporting was required; don't have a copy of the reportable disease list.
- Do not know how to report; don't have form or telephone number.
- Concern about confidentiality and doctor-patient relationship.
- No incentive to report. Time-consuming. Unaware of value.

How to Improve Reporting

- Contact physicians in the community
  - Tell them the health department is very interested in morbidity reporting
- Maintain a reasonable list of reportable diseases
- Maximize contact through presentations, mailings, newsletters, media, etc.
- Use the data

Nonetheless...

- The best system we have for communicable disease morbidity
- Information available quickly and from all jurisdictions
- Can detect outbreaks / changes in incidence
- Allows disease control measures to be implemented

Data Source: Registries

- Information from multiple sources is linked for each individual over time.
  - Diverse sources of information. E.g., hospitals (sometimes >1), pathology, death certificates.
- Used for cancer, congenital anomalies, trauma, etc.
- Most are passive but resource intensive.
- More lag in data availability due to complexity of data collection process.

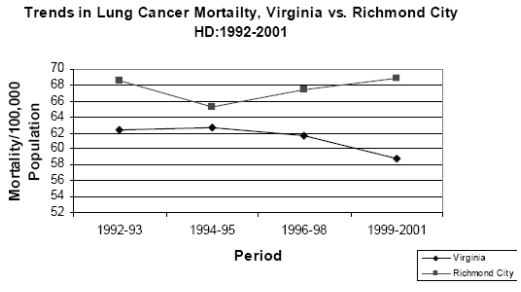
Populations Covered by Registries

- Hospital-based
- Population-based
- Exposure registries
  - World Trade Center Health Registry
  - Three Mile Island

Example: Virginia Cancer Registry

- Methods prescribed by ACOS, NAACCR, Virginia regulations, CDC.
- Hospital registries are main source of data.
- Voluntary reporting, 1970-1989
- Mandatory reporting, 1990-present
- Demographic, geographic, clinical data
- Annual merge with vital records for survival information.

Registry Data



Electronic Surveillance

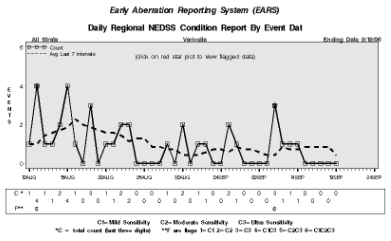
- National Electronic Disease Surveillance System (NEDSS)
  - A set of criteria developed by CDC that all public health surveillance systems must meet
  - Virginia adopted CDC's NEDSS Base System
  - Supported by EP&R funds

NEDSS

- Shared secure web-based disease surveillance database for Virginia
  - Eliminates delays in reporting
  - Improves communication about cases
  - Assists in earlier detection of events
  - Provides more data in electronic form for analysis
- All Virginia health departments connected by the end of 2006
- Includes electronic reporting from laboratories

EARS

- Early Aberration Reporting System
- Daily automated analysis of surveillance data



Data Source: Sentinel Systems

- To gather timely public health information in a relatively inexpensive manner.
- Cannot derive precise estimates of prevalence or incidence in the population.
- Sentinel Health Events
- Sentinel Sites
- Sentinel Providers

Sentinel Health Events

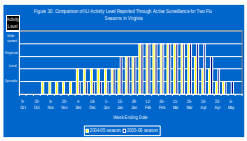
- A condition whose occurrence serves as a warning signal.
- Particularly useful for occupational exposures.
- Silicosis, occupational asthma, pesticide poisoning, lead poisoning, carpal tunnel syndrome.
- Cases trigger intervention activities.

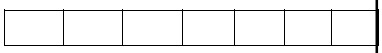
Sentinel Sites or Providers

- Surveillance at certain hospitals, clinics, or physician practices.
- Sentinel Sites - monitor conditions in subgroups that may be more vulnerable
  - E.g., drug clinic, STD clinic, MCH clinic
- Sentinel Providers - monitor activity in ambulatory care settings.
  - For diseases that are not reportable
  - For influenza

Experience with Active Sentinel Surveillance

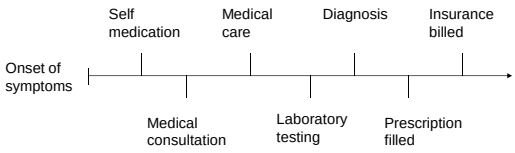
- Sentinel physician surveillance for influenza
  - Conducted every year from Oct/Nov thru March/April.
  - Selected offices called weekly to ascertain number of visits for influenza-like illness in the week.
  - Level of flu activity determined
  - Used to track flu season.





Syndromic Surveillance

- Uses pre-diagnostic indicators to identify emerging health problems



Automating Syndromic Surveillance

- Began as manual activity just after 9/11/01
- Automated in 2004 with ESSENCE
  - Electronic Surveillance System for the Early Notification of Community-Based Epidemics (Johns Hopkins University, Applied Physics Laboratory)
- Access limited to approved VDH staff
- Collaborate with District of Columbia and Maryland to monitor national capital region

ESSENCE

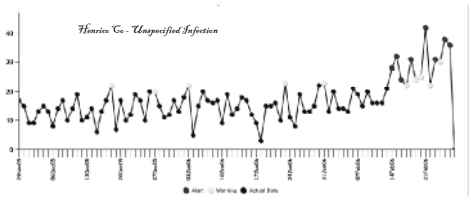
- Hospital emergency departments and urgent care centers electronically transmit chief complaints to secure VDH server every day
- System also includes:
  - Over the counter drug sales
  - Military claims
  - HMO claims
  - School attendance (being added)

Syndromes

- Complaints tallied into syndrome categories
  - Death
  - Sepsis (serious infection)
  - Rash
  - Respiratory (e.g., cough)
  - Gastrointestinal (e.g., diarrhea)
  - Unspecified Infection (fever)
  - Neurological (e.g., dizziness)
  - Other

ESSENCE

- Automated analyses identify unusual patterns and increases are investigated



Exposure Detection

- U.S. Postal Services' BioHazard Detection System
  - Tests for anthrax in mail sorting area every hour
  - Selected Post Offices in Virginia
  - Response is collaborative
- Homeland Security/DOD BioWatch System
  - DC area, including northern Virginia
  - Central Virginia around Richmond
  - Eastern Virginia around military bases
  - Monitors for biologic agents atop buildings

Data Source: Surveys

- If done continually or periodically, can monitor risk factors and changes in prevalence over time
- Can also assess knowledge, attitudes
- People usually queried only once and not monitored on an individual basis after that
- From questionnaires, interviews (in person or telephone), or record review

National Surveys – www.cdc.gov/nchs

- National Health Interview Survey
  - Random selection of households
  - In home interview gathering information on all in the household
  - Self-reported illnesses, chronic conditions, injuries, impairments, use of health services
  - Civilian, non-institutionalized population

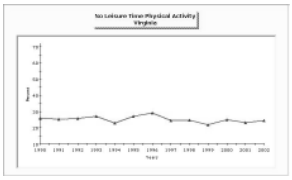
National Surveys, continued

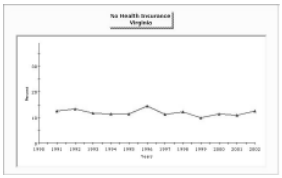
- National Health and Nutrition Examination Survey (NHANES)
  - Prevalence of chronic conditions, distribution of physiologic and anthropomorphic measures, and nutritional status for representative samples of the U.S. population
- National Health Care Survey, includes
  - National Hospital Discharge Survey
  - National Ambulatory Medical Care Survey

BRFSS

- Behavioral Risk Factor Surveillance System
  - Random digit telephone surveys on non-institutionalized adults' health behavior and use of prevention services
  - Height, weight, physical activity, smoking, alcohol use, seatbelt use, cholesterol screening, mammography, etc.
  - Done in most states
  - CDC program

BRFSS Charts





Other Survey Examples

- Exit interviews at health facilities
- Special studies
  - Risk-behavior
- Cluster surveys
  - Rapid surveillance after emergencies

Data Source Administrative Data

- Routinely collected for other reasons.
- E.g., hospital discharge data collected for billing purposes, Medicaid and Medicare data, emergency department data, data collected in managed care organizations.
- Virginia Health Information (VHI) – our hospital discharge database

Cause of Injury Death
From Hospital Discharge Data

Cause of Injury	N	%	Rate per 100,000*	2002 US Age-Adjusted rate per 100,000**
Cut/pierce	59	1.59	0.79	1.0
Drowning/submersion	97	2.62	1.30	1.4
Fall	371	10.02	4.97	5.9
Fire/flame	123	3.32	1.65	1.2
Hot object/substance	2	0.05	0.03	10.4
Firearm	795	21.46	10.66	1.3
Machinery	27	0.73	0.36	.2
MVT Occupant	284	7.67	3.81	1.1
MVT Motorcyclist	59	1.59	0.79	7.4
MVT Pedal cyclist	7	0.19	0.09	.2
MVT Pedestrian	94	2.54	1.26	1.7
MVT Unspecified	441	11.91	5.91	4.8
Pedal cyclist, other	1	0.03	0.01	.4
Pedestrian, other	19	0.51	0.25	.5
Other land transport	28	0.76	0.38	.7
Other transport	15	0.40	0.20	.7
Other natural/environmental	32	0.86	0.43	.4
Poisoning	601	16.23	8.06	3
Struck by, against	24	0.65	0.32	.4
Suffocation	324	8.75	4.34	9.2
Other specified and classifiable	30	0.81	0.40	.4
Other specified, not elsewhere classifiable	32	0.86	0.43	4.4
Unspecified	239	6.45	3.20	2.3
Total	3,704	100.00	49.65	55.7

*Crude rate per 100,000 population
**Adjusted to 2000 standard population

http://www.vahealth.org/CDVSP/VOSKS/

Usefulness of Administrative Data

- Depends on:
  - What information is computerized
  - Standardization of codes for diagnoses, symptoms, procedures, reasons for the visit
  - Time between occurrence of health event and availability of data
  - Ability to link with other data systems
  - Whether supplementary information can be obtained.

Data Sources We Covered

- Vital Statistics
- Notifiable Diseases
- Registries
- Sentinel Surveillance
- Syndromic Surveillance
- Surveys
- Administrative Data

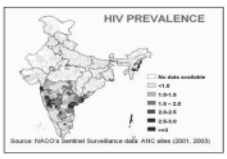
Other Important Surveillance Systems

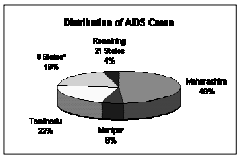
- Injury
- Diabetes
- Child/Adolescent Hospitalizations
- Special temporary systems
- Drug safety
- Food Safety
- Etc. – Public health collects a lot of information on the health of our communities!

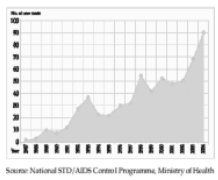
Analysis of Surveillance Data

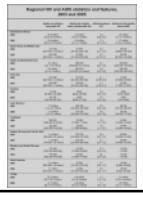
- Descriptive epidemiology
  - Person, place, time
- Incidence and Prevalence
  - Rates -- crude, specific, standardized
- Trends and seasonality
- Geographic clustering (maps)

Graphics used to describe data









Interpretation of Surveillance Data

- Limitations
  - Under-reporting
  - Biased reporting
  - Inconsistent case definitions
- Consider context
  - Seasonality
  - Recent policy changes

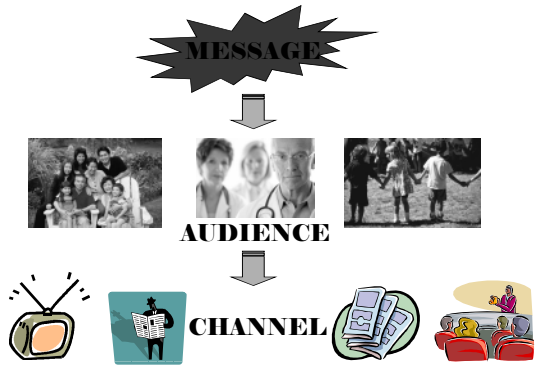
Interpretative Uses of Surveillance Data

- Identifying epidemics
- Identifying new syndromes or risk groups
- Monitoring trends
- Evaluating public policy
- Projecting future needs

Data Dissemination

- What should be said? To whom? Through what communication medium? How should the message be stated? What effect did the message create?
- Determine answers based on the purpose of the system.
- SOCO - single overriding communication objective. [What is new? Who is affected? What works best?]

Data Dissemination



Evaluating Surveillance Systems

- System objectives and usefulness
  - Actions taken as a result of the data.
  - Does the system do what it's supposed to do?
- Operation of the system
  - who is reporting? to whom? what information is collected? how is information stored? who analyzes the data? what are the findings? how often are reports disseminated? to whom? etc.
- Cost

Evaluation - System Attributes

- Simplicity
  - Should be as simple as possible and as easy to operate as possible.
- Flexibility
  - Should be able to adapt to changing needs.
- Acceptability
  - Willingness of individuals or organizations to participate in the surveillance system. (Judge based on completeness, timeliness, reporting)

Evaluation - System Attributes

- Sensitivity
  - Proportion of cases detected by the system. Completeness of reporting. Detect epidemics?
  - Increased awareness, new diagnostic test, change in surveillance method may impact.
- Predictive Value Positive
  - Proportion of persons identified as having the disease who actually have it.

Sensitivity/Specificity and Predictive Value +/-

		Condition Present		
		Yes	No	
Detected by Surveill	Yes	True positive (A)	False positive (B)	A+B
	No	False negative (C)	True negative (D)	C+D
		A+C	B+D	

Sensit.= A/A+C PVP= A/A+B
Specif.= D/B+D PVN= D/C+D

Evaluation - System Attributes

- Representativeness
  - Do the characteristics of reported events compare favorably with those in the population?
  - Is there case ascertainment bias?
  - Bias in descriptive information about a reported case?
- Timeliness
  - Any delay between the steps? (onset, diagnosis, report to public health, disease control actions)

Ethical and Legal Issues Relating to Surveillance

- Professional obligations
- Protecting confidentiality and privacy
- Informed consent
  - Mandated activity vs. Research
- Maintaining public trust
- Right of Access

"Good surveillance does not necessarily ensure the making of right decisions, but it reduces the chances of wrong ones."

Alexander D. Langmuir
NEJM 1963; 268:182-191

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